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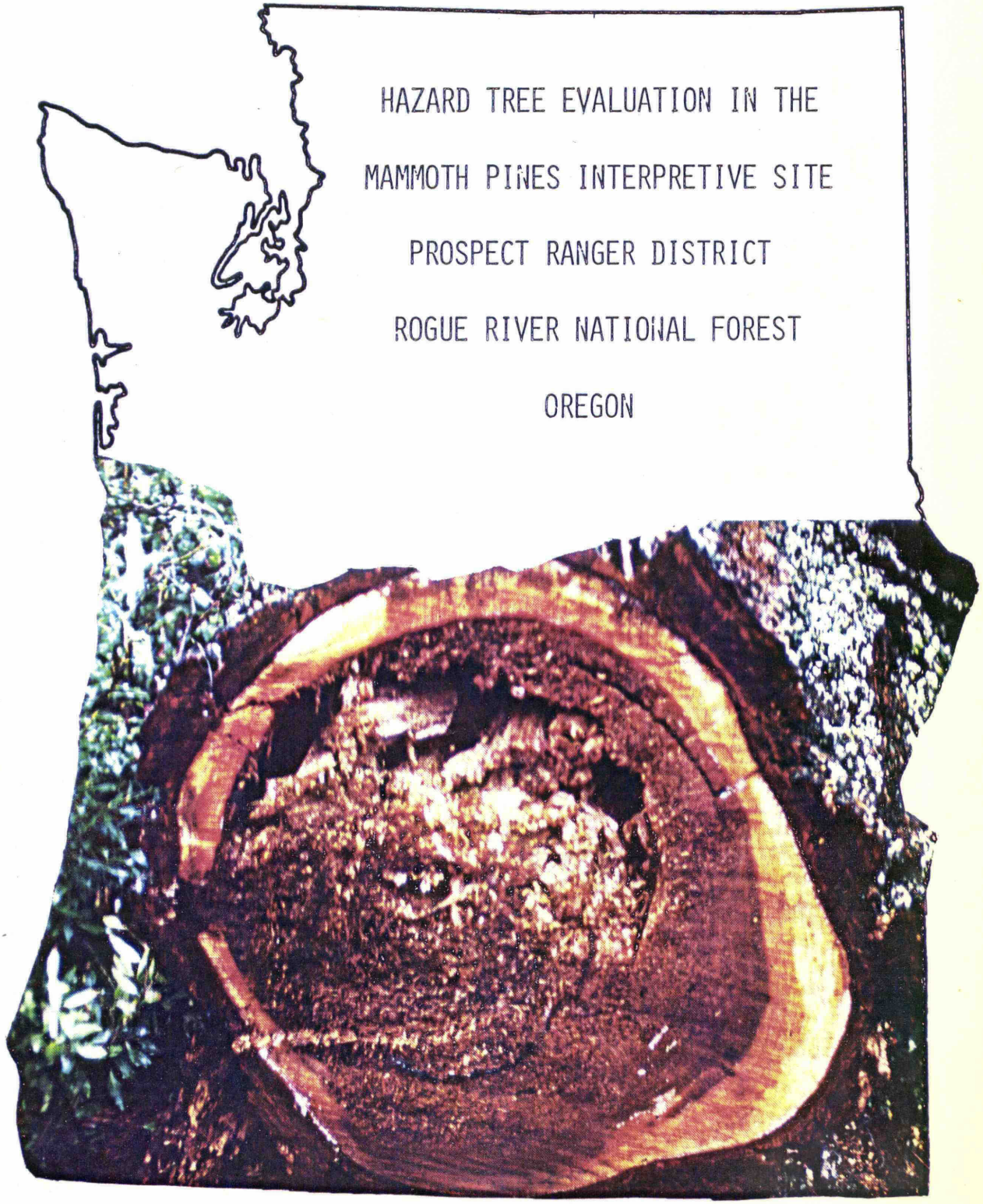

HAZARD TREE EVALUATION IN THE MAMMOTH PINES INTERPRETIVE SITE PROSPECT RANGER DISTRICT ROGUE RIVER NATIONAL FOREST OREGON

3400
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Hazard Tree Evaluation in the Mammoth Pines Interpretive Site, Prospect Ranger District, Rogue River National Forest

By

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INTRODUCTION

The Mammoth Pines Site, Prospect Ranger District, Rogue River National Forest, (T. 31 S., R. 3 E., sec 32, Figure 1) offers recreationists a rare opportunity to observe extremely large, old-growth sugar and ponderosa pines, *Pinus lambertiana* and *P. ponderosa*, in a mixed conifer forest setting. Improvements at the site currently are minimal, consisting of a gravel parking spur, an interpretive nature trail, two outhouses, and a lightly developed picnic area. The District is considering a plan to invest a substantial sum of money (approximately $100,000) to further develop the picnic area.

In the fall of 1979, a large Douglas-fir, *Pseudotsuga menziesii* was windthrown and smashed a table in the picnic area at Mammoth Pines. Investigation of the butt and roots of this and a nearby tree that had been windthrown previously showed both to have advanced cases of laminated root rot, caused by *Phellinus (Poria) weirii*. Other Douglas-firs in the vicinity exhibited thin, chlorotic crowns, indicating that they might be infected as well. In view of this, the District requested that Forest Insect and Disease Management pathologists do a survey of the recreation site to determine distribution and severity of root disease and provide recommendations to minimize future tree hazard.

METHODS

A survey was done on February 21 and 22, 1980. The recreation site was divided into two survey units: (1) the nature trail area, and (2) the parking lot-picnic area. These units were surveyed at different intensities based on the different current and projected intensities of visitor use. In the nature trail area, basal area plots were taken at 100-foot intervals along the trail, 25 feet east or west on alternating sides (Figure 2, Area 1). In the parking lot-picnic area, plots were taken along a 50 x 50 foot grid (Figure 2, Area 2). A 40 factor prism was used to define plots in both areas, and all

standing "in" trees (living or dead) were tallied by species, DBH, and whether or not affected by root disease. From this data, per acre basal area, number of trees, and board foot volume were calculated by species, diameter, and presence of root disease for each survey unit. In basal area plots, all dead trees and all living trees of species susceptible to laminated root rot had two roots on opposite sides of the butt excavated to a distance of 3 feet and examined for ectotrophic mycelia of *P. weirii*. Butts and roots of dead trees were chopped into to inspect for signs of other fungi and to examine character of wood decay. Large trees (>12 inches DBH) with thin or chlorotic crowns were cored with an increment borer to determine if they were hollow or had decay in the stem. Signs and symptoms of heartrot including conks or large wounds were recorded for each tree.

RESULTS

Nature Trail Area - Mean total and diseased basal area, number of trees, and volume per acre for the nature trail area are shown in Tables 1, 2, and 3. Laminated root rot was found in the northwest corner of the area (Figure 3) affecting Douglas-fir and a few white fir, *Abies concolor*. Within infected plots, the disease was affecting 45 percent of the trees containing 11 percent of the volume. Thirty (30) percent of the infected trees containing 14 percent of the volume were dead. Most infected trees in the nature trail area were relatively small (18 in. DBH or less). Armillaria root rot, caused by *Armillaria mellea*, also was found in one plot in the nature trail area (Figure 3), killing young Douglas-fir. In this infected plot, 67 percent of the trees containing 19 percent of the volume were killed.

Three large (DBH = 41.7, 58.1, and 50.0 in.) Douglas-firs had either conks of *Fomes pini* (2 trees) or old, large, basal wounds (1 tree).

Parking Lot-Picnic Area - Mean total and diseased basal area, number of trees, and volume per acre for the parking lot-picnic area are shown in Tables 4, 5, and 6. Laminated root rot was found throughout the area, except for the extreme northern edge (Figure 3), affecting Douglas-fir. Within infected plots, the disease was affecting 66 percent of the trees containing 81 percent of the volume. Most infected trees were still living but showed advanced crown symptoms and extensive butt rot (Figure 4). Many infected trees were quite large, 20 in. DBH or greater, with some in the 40 in. + class. A few trees infected by *A. mellea* were found at the margin of the laminated root rot area.

Except for one windthrown Douglas-fir, no conks were observed on trees in the parking lot-picnic area.

DISCUSSION

The parking lot-picnic area and the northwest corner of the nature trail are experiencing a root disease epidemic caused by *Phellinus weirii*. Some of the smaller infected trees have died. However, most infected trees are still living though they have considerable columns of butt rot. A few of the living infected trees have been windthrown, one resulting in damage to a picnic table. It is not uncommon for large Douglas-firs infected with *P. weirii* to remain alive for several years, if not decades, following initial root infection. In the interim, however, considerable butt and root decay can develop, often leading to windthrow of the still living tree.

An area near the felled Mammoth Pine and two trees in the picnic area were affected by Armillaria root rot. In westside forest types, this disease generally affects weakened or suppressed trees or trees already infected by *P. weirii*. In this area, it is considered secondary to the main problem, laminated root rot.

One of the windthrown Douglas-firs had heartrot at considerable height in the trunk caused by the stem decay fungus, *Fomes pini* (Figure 5). Conks were present, but they were small and very difficult to see at the height that they were growing. Two other large Douglas-firs had conspicuous *Fomes pini* conks; one tree adjacent to the outhouses and one tree near the nature trail. Conks generally indicate considerable internal decay. Trees that have less than the minimum cylinder of sound wood in the stem as indicated in the table below, have a high potential for breakage and should be treated if within striking distance of valuable targets:

Tree DBH (in.)	Minimum Living Shell Thickness (in.)1/	Tree DBH (in.)	Minimum Living Shell Thickness (in.)1/
4	1.0	40	6.0
8	1.5	44	6.5
12	2.0	48	7.0
16	2.5	52	8.0
20	3.0	56	8.5
24	3.5	60	9.0
28	4.0	64	9.5
32	4.5	68	10.0
36	5.5		

Modified from Wagener, 1963

1/ Increase by 25 percent for trees with open wounds.

Minimum living shell thickness can be measured with an increment borer or electric drill. If conks are out-of-reach, trees may have to be climbed or ladders used to determine minimum living shell thickness. As a general rule, trees with two or more conks separated by 10 or more feet have extensive decay and should be removed if within striking distance of valuable targets. In cases of butt rot caused by *P. weirii*, the values for minimum living shell thickness do not apply, since considerable root decay usually accompanies butt decay, thus making infected trees more prone to windthrow than to stem breakage.

RECOMMENDATIONS

The following management alternatives for hazard tree reduction in the present and future stand are suggested:

Nature Trail Area

Alternative 1:

Do nothing -- The disease center in the northwest corner of the trail area may continue to expand and kill Douglas-fir and white fir. Ponderosa and sugar pines are resistant and will not be killed by laminated root rot. Some trees also may be killed by Armillaria root rot. Both diseases spread from root system to root system at the rate of 1- to 3-feet per year. However, disease centers have been known to become dormant and killing cease, especially where stand composition changes. Three large Douglas-firs (two with *Fomes pini* conks and one with an old basal wound) have a high probability of failing, especially the tree with two conks. The hazard associated with diseased trees in the nature trail area is relatively low since most of the diseased trees are less than 18 inches DBH. Also, the probability of such trees failing and striking people or permanent structures is relatively low as compared to that in the parking lot-picnic area.

Alternative 2:

Remove diseased trees within striking distance of outhouses and parking lot -- Some of the larger trees on the nature trail are within striking distance of the parking lot and the outhouses. A relatively high degree of hazard is associated with the outhouses because of their permanence and value. Also, a relatively high degree of hazard is associated with the parking lot since vehicles may remain there for extended periods. Root-diseased trees, the tree with two *Fomes pini* conks, and the trees with the old basal wound within striking distance of outhouses or parking lot should be removed.

Parking Lot-Picnic Area

Alternative 1:

Do nothing -- The disease center that occupies most of the parking lot-picnic area may continue to expand and infect additional Douglas-firs and white firs. Some trees will be killed outright; others will be windthrown while alive. All infected trees will experience severe butt and root decay.

Thirty-six percent of the trees have confirmed disease. Another 10 percent are probably infected but could not be detected in the survey. All of the confirmed diseased trees have a high probability of either dying or being windthrown within 10 years, resulting in possible damage to vehicles parked in the lot, picnic tables, or visitors using the site. Probability of trees failing and striking people is greater in the picnic area than in the nature trail area (1) because of the greater number of trees with a high probability of failure in the picnic area, and (2) because people tend to occupy a single spot in the picnic area for longer periods of time than in the nature trail area. Closure of the parking lot and picnic area during the off-season will decrease the probability of visitors or their vehicles being struck by windthrown trees.

Alternative 2:

Remove diseased trees within striking distance of the parking lot and picnic area -- Except for a few uninfected small-diameter trees, this alternative would result in a virtual clearcut of the parking lot-picnic area. Residual trees might be windthrown because of additional stand opening. Obviously, such an alternative will seriously alter the character of the area. If this alternative is selected and the area replanted, highly susceptible species such as Douglas-fir or white fir should be avoided. Instead, disease-resistant species such as ponderosa or sugar pine should be used. Removal of diseased trees will not remove root disease from the site.

It is further recommended that the picnic area not be improved as proposed unless Alternative 2 is selected. If Alternative 2 is rejected and the proposed improvements are made in the picnic area, the increase in the number and value of permanent structures in conjunction with the additional visitor use will greatly increase the hazard. Serious loss of property or human life may result should even one of the diseased trees fail.

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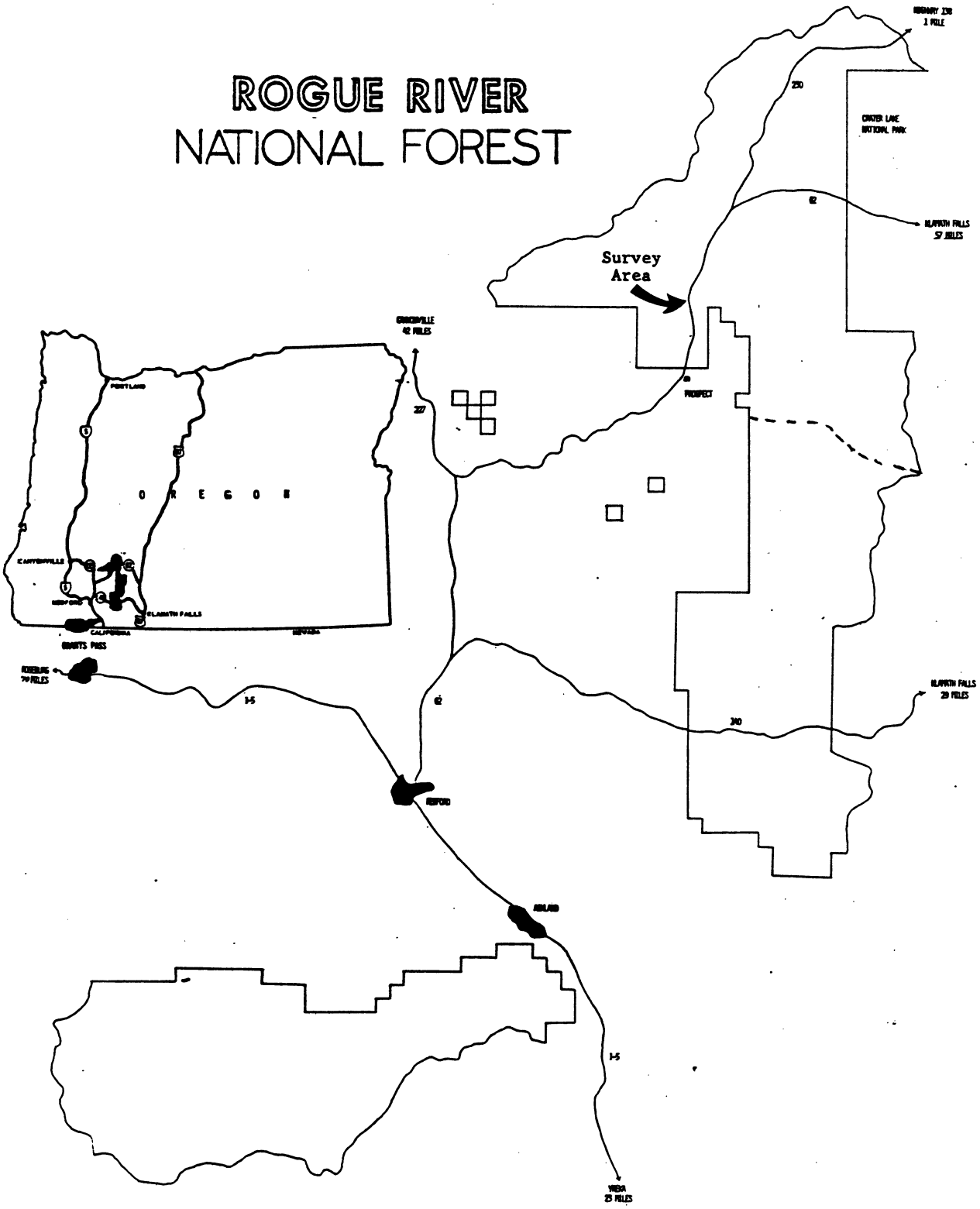

igure 1--Location of area surveyed on the Rogue River National Forest. Dotted line depicts southern boundary of Prospect Ranger District.

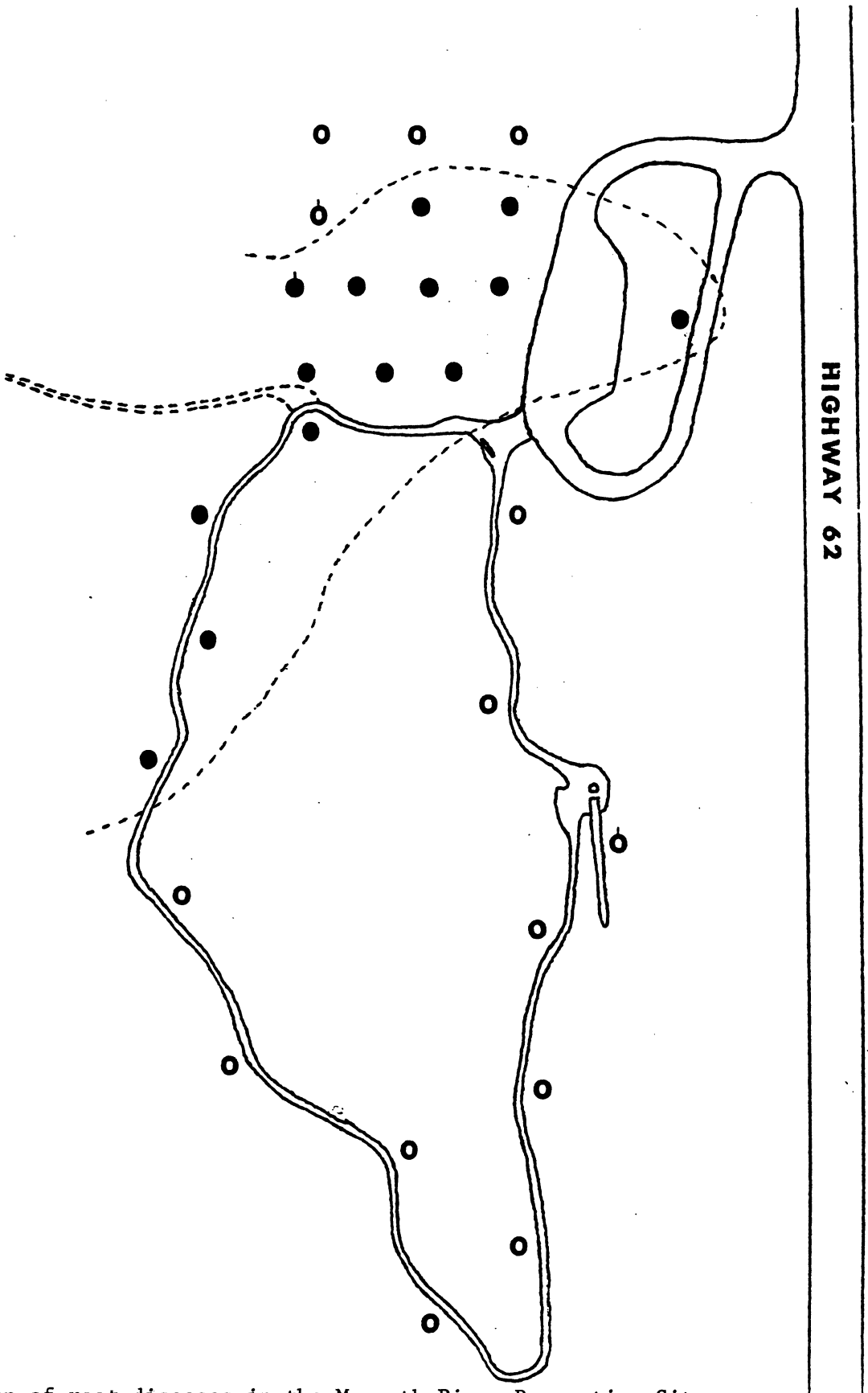

Figure 2-- Location of root diseases in the Mammoth Pines Recreation Site. Dotted line delineates the approximate boundary of the laminated root rot center.

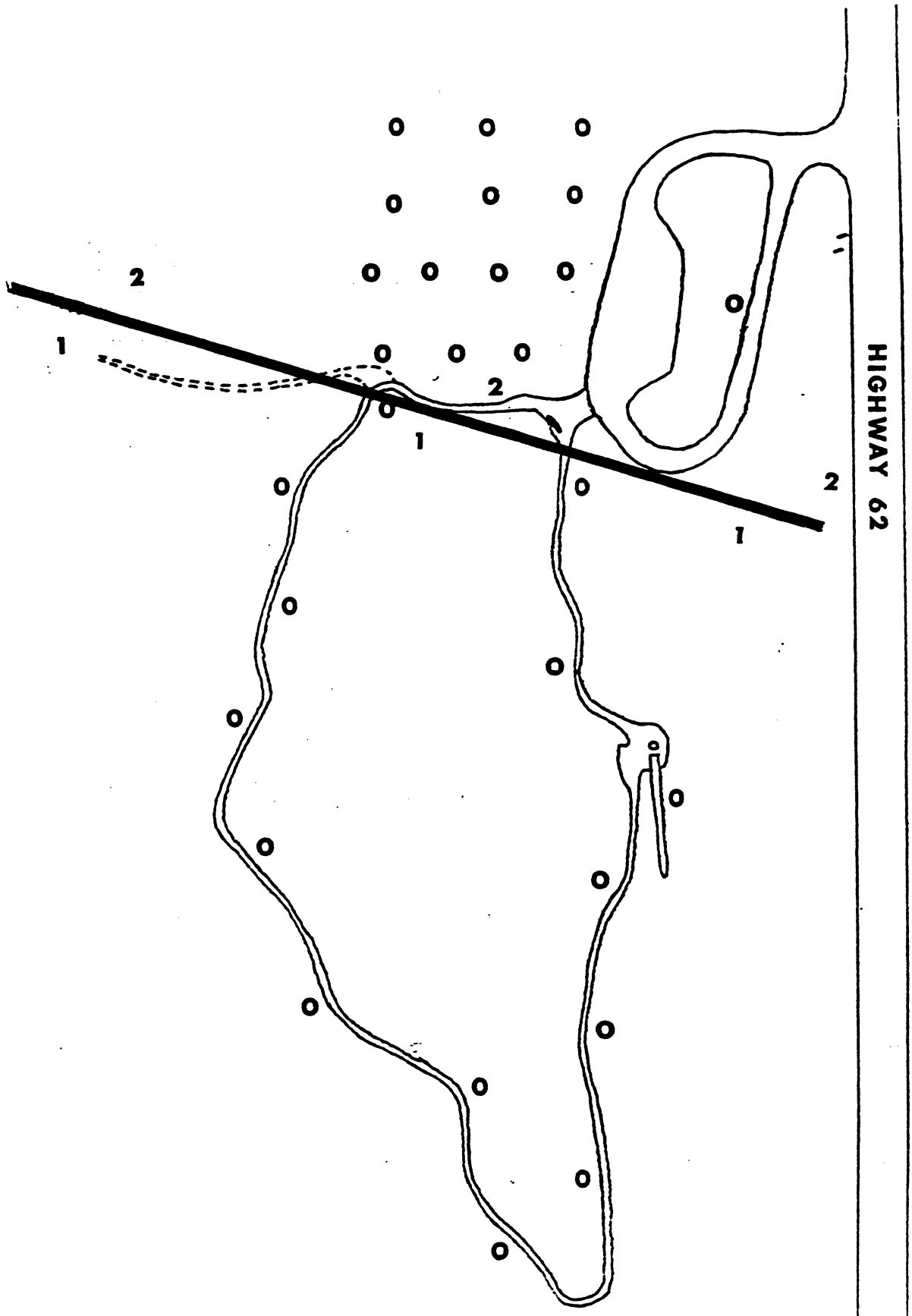

Figure 3--Sampling layout used in survey of Mammoth Pines Recreation Site. The area south of the heavy, dark line labelled 1 is the nature trail area. That to the north labelled 2 is the parking lot-picnic area. Circles represent basal area plots.

able 1--Mean basal area per acre ($ft.^2$) by species, DBH, and root disease class in nature trail area, Mammoth Pines

DBH lass (in.)	Douglas-fir		White Fir		Ponderosa Pine		Sugar Pine		All Tree Species		
	Healthy	Diseased	Healthy	Diseased	Healthy	Diseased	Healthy	Diseased	Healthy	Diseased	Total
8	3.2	8.4	5.6	0	0	0	0	0	8.8	8.4	17.2
10	6.0	5.6	0	0	0	0	0	0	6.0	5.6	11.6
12	5.6	2.8	2.8	0	2.8	0	0	0	11.2	2.8	14.0
14	14.4	0	2.8	2.8	0	0	0	0	17.2	2.8	20.0
16	5.6	2.8	11.6	0	0	0	0	0	17.2	2.8	20.0
18	5.6	2.8	0	0	0	0	0	0	5.6	2.8	8.4
20	8.4	0	2.8	0	0	0	0	0	11.2	0	11.2
22	8.4	0	0	0	0	0	0	0	8.4	0	8.4
24	11.6	0	2.8	0	0	0	0	0	14.4	0	14.4
26	2.8	0	0	0	0	0	0	0	2.8	0	2.8
28	2.8	0	0	0	0	0	0	0	2.8	0	2.8
30	2.8	0	0	0	0	0	2.8	0	5.6	0	5.6
32	0	0	0	0	0	0	0	0	0	0	0
34	2.8	0	0	0	2.8	0	0	0	5.6	0	5.6
36	5.6	0	0	0	2.8	0	0	0	8.4	0	8.4
38	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	2.8	0	0	0	2.8	0	2.8
42	2.8	0	0	0	2.8	0	0	0	5.6	0	5.6
44	0	0	0	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0
50	2.8	0	0	0	2.8	0	0	0	5.6	0	5.6
52+	2.8	2.8	0	0	8.4	0	2.8	0	14.0	2.8	16.8
Total	94.0	25.2	28.4	2.8	25.2	0	5.6	0	153.2	28.0	181.2

Table 2--Mean number of trees per acre by species, DBH, and root disease class in nature trail area, Mammoth Pines

DBH Class (in.)	Douglas-fir		White Fir		Ponderosa Pine		Sugar Pine		All Tree Species		
	Healthy	Diseased	Healthy	Diseased	Healthy	Diseased	Healthy	Diseased	Healthy	Diseased	Total
8	9.1	24.1	16.0	0	0	0	0	0	25.1	24.1	49.2
10	11.0	10.3	0	0	0	0	0	0	11.0	10.3	21.3
12	7.1	3.6	3.6	0	3.6	0	0	0	14.3	3.6	17.9
14	13.5	0	2.6	2.6	0	0	0	0	16.1	2.6	18.7
16	4.0	2.0	8.3	0	0	0	0	0	12.3	2.0	14.3
18	3.1	1.6	0	0	0	0	0	0	3.1	1.6	4.7
20	3.8	0	1.3	0	0	0	0	0	5.1	0	5.1
22	3.2	0	0	0	0	0	0	0	3.2	0	3.2
24	3.7	0	0	0	0	0	0	0	3.7	0	3.7
26	0.8	0	0	0	0	0	0	0	0.8	0	0.8
28	0.6	0	0	0	0	0	0	0	0.6	0	0.6
30	0.6	0	0	0	0	0	0.6	0	1.2	0	1.2
32	0	0	0	0	0	0	0	0	0	0	0
34	0.4	0	0	0	0.4	0	0	0	0.8	0	0.8
36	0.8	0	0	0	0.4	0	0	0	1.2	0	1.2
38	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0.3	0	0	0	0.3	0	0.3
42	0.3	0	0	0	0.3	0	0	0	0.6	0	0.6
44	0	0	0	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0
50	0.2	0	0	0	0.2	0	0	0	0.4	0	0.4
52+	0.2	0.1	0	0	0.4	0	0.1	0	0.8	0.1	0.8
Total	62.4	41.7	31.8	2.6	5.6	0	0.7	0	100.6	44.3	144.8

Table 3--Mean volume per acre (M bd. ft.) by species, DBH, and root disease class in nature trail area, Mammoth Pines

DBH Class (in.)	Douglas-fir		White Fir		Ponderosa Pine		Sugar Pine		All Tree Species		
	Healthy	Diseased	Healthy	Diseased	Healthy	Diseased	Healthy	Diseased	Healthy	Diseased	Total
8	0.3	0.9	0.6	0	0	0	0	0	0.9	0.9	1.8
10	0.7	0.6	0	0	0	0	0	0	0.7	0.6	1.3
12	0.8	0.4	0.4	0	0.4	0	0	0	1.6	0.4	2.0
14	1.9	0	0.3	0.4	0	0	0	0	2.2	0.4	2.6
16	1.0	0.5	1.6	0	0	0	0	0	2.6	0.5	3.1
18	1.1	0.6	0	0	0	0	0	0	1.1	0.6	1.7
20	1.6	0	0.5	0	0	0	0	0	2.1	0	2.1
22	1.7	0	0	0	0	0	0	0	1.7	0	1.7
24	2.8	0	0.5	0	0	0	0	0	3.3	0	3.3
26	0.7	0	0	0	0	0	0	0	0.7	0	0.7
28	0.6	0	0	0	0	0	0	0	0.6	0	0.6
30	0.8	0	0	0	0	0	0.6	0	1.4	0	1.4
32	0	0	0	0	0	0	0	0	0	0	0
34	0.7	0	0	0	0.7	0	0	0	1.4	0	1.4
36	1.7	0	0	0	0.9	0	0	0	2.6	0	2.6
38	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0.9	0	0	0	0.9	0	0.9
42	0.9	0	0	0	0.9	0	0	0	1.8	0	1.8
44	0	0	0	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0
50	1.0	0	0	0	1.0	0	0	0	2.0	0	2.0
52+	1.9	0.6	0	0	2.3	0	1.2	0	4.8	0.6	5.4
Total	20.2	3.6	3.9	0.4	7.1	0	1.8	0	32.4	4.0	36.4

Table 4--Mean basal area per acre ($ft.^2$) by species, DBH, and root disease class in parking lot-picnic area, Mammoth Pines

DBH Class (in.)	Douglas-fir		Western Redcedar		Sugar Pine		All Tree Species		
	Healthy	Diseased	Healthy	Diseased	Healthy	Diseased	Healthy	Diseased	Total
8	2.8	2.8	0	0	0	0	2.8	2.8	5.6
10	5.6	0	0	0	0	0	5.6	0	5.6
12	6.0	5.6	0	0	0	0	6.0	5.6	11.6
14	5.6	0	0	0	0	0	5.6	0	5.6
16	5.6	0	2.8	0	0	0	8.4	0	8.4
18	2.8	0	0	0	0	0	2.8	0	2.8
20	0	5.6	0	0	0	0	0	5.6	5.6
22	2.8	2.8	0	0	0	0	2.8	2.8	5.6
24	0	5.6	0	0	0	0	0	5.6	5.6
26	5.6	2.8	0	0	0	0	5.6	2.8	8.4
28	0	2.8	0	0	0	0	0	2.8	2.8
30	5.6	2.8	0	0	0	0	5.6	2.8	8.4
32	2.8	2.8	0	0	0	0	2.8	2.8	5.6
34	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0
38	0	2.8	0	0	0	0	0	2.8	2.8
40	0	0	0	0	0	0	0	0	0
42	0	8.4	0	0	0	0	0	8.4	8.4
44	0	5.6	0	0	0	0	0	5.6	5.6
46	0	11.6	0	0	0	0	0	11.6	11.6
48	0	2.8	0	0	0	0	0	2.8	2.8
50	5.6	0	0	0	0	0	5.6	0	5.6
52+	0	8.4	0	0	2.8	0	2.8	8.4	11.2
Total	50.8	73.2	2.8	0	2.8	0	56.4	73.2	129.6

Table 5--Mean number of trees per acre by species, DBH, and root disease class in parking lot-picnic area, Mammoth Pines

DBH Class (in.)	Douglas-fir		Western Redcedar		Sugar Pine		All Tree Species		
	Healthy	Diseased	Healthy	Diseased	Healthy	Diseased	Healthy	Diseased	Total
8	8.0	8.0	0	0	0	0	8.0	8.0	16.0
10	10.3	0	0	0	0	0	10.3	0	10.3
12	7.7	7.1	0	0	0	0	7.7	7.1	14.8
14	5.2	0	0	0	0	0	5.2	0	5.2
16	4.0	0	2.0	0	0	0	6.0	0	6.0
18	1.6	0	0	0	0	0	1.6	0	1.6
20	0	2.6	0	0	0	0	0	2.6	2.6
22	1.0	1.1	0	0	0	0	1.0	1.1	2.1
24	0	1.8	0	0	0	0	0	1.8	1.8
26	1.5	0.8	0	0	0	0	1.5	0.8	2.3
28	0	0.6	0	0	0	0	0	0.6	0.6
30	1.1	0.6	0	0	0	0	1.1	0.6	1.7
32	0.5	0.5	0	0	0	0	0.5	0.5	1.0
34	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0
38	0	0.4	0	0	0	0	0	0.4	0.4
40	0	0	0	0	0	0	0	0	0
42	0	0.9	0	0	0	0	0	0.9	0.9
44	0	0.5	0	0	0	0	0	0.5	0.5
46	0	1.0	0	0	0	0	0	1.0	1.0
48	0	0.2	0	0	0	0	0	0.2	0.2
50	0.4	0	0	0	0	0	0.4	0	0.4
52+	0	0.5	0	0	0.1	0	0.1	0.5	0.6
Total	41.3	26.6	2.0	0	0.1	0	43.4	26.6	69.0

Table 6--Mean volume per acre (M bd. ft.) by species, DBH, and root disease class for parking lot-picnic area, Mammoth Pines

DBH Class (in.)	Douglas-fir		Western Redcedar		Sugar Pine		All Tree Species		
	Healthy	Diseased	Healthy	Diseased	Healthy	Diseased	Healthy	Diseased	Total
8	0.3	0.3	0	0	0	0	0.3	0.3	0.6
10	0.6	0	0	0	0	0	0.6	0	0.6
12	0.9	0.8	0	0	0	0	0.9	0.8	1.7
14	0.7	0	0	0	0	0	0.7	0	0.7
16	1.0	0	0.4	0	0	0	1.4	0	1.4
18	0.6	0	0	0	0	0	0.6	0	0.6
20	0	1.1	0	0	0	0	0	1.1	1.1
22	0.5	0.6	0	0	0	0	0.5	0.6	1.1
24	0	1.4	0	0	0	0	0	1.4	1.4
26	1.2	0.7	0	0	0	0	1.2	0.7	1.9
28	0	0.6	0	0	0	0	0	0.6	0.6
30	1.5	0.8	0	0	0	0	1.5	0.8	2.3
32	0.7	0.7	0	0	0	0	0.7	0.7	1.4
34	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0
38	0	1.0	0	0	0	0	0	1.0	1.0
40	0	0	0	0	0	0	0	0	0
42	0	2.8	0	0	0	0	0	2.8	2.8
44	0	1.8	0	0	0	0	0	1.8	1.8
46	0	4.3	0	0	0	0	0	4.3	4.3
48	0	0.9	0	0	0	0	0	0.9	0.9
50	2.0	0	0	0	0	0	2.0	0	2.0
52+	0	2.9	0	0	0.9	0	0.9	2.9	3.8
Total	10.0	20.7	0.4	0	0.9	0	11.3	20.7	32.0

Figure 4--Butt rot caused by *Phellinus weirii* in Douglas-fir. Note laminated type of decay and thin rind of sound wood surrounding decay column.

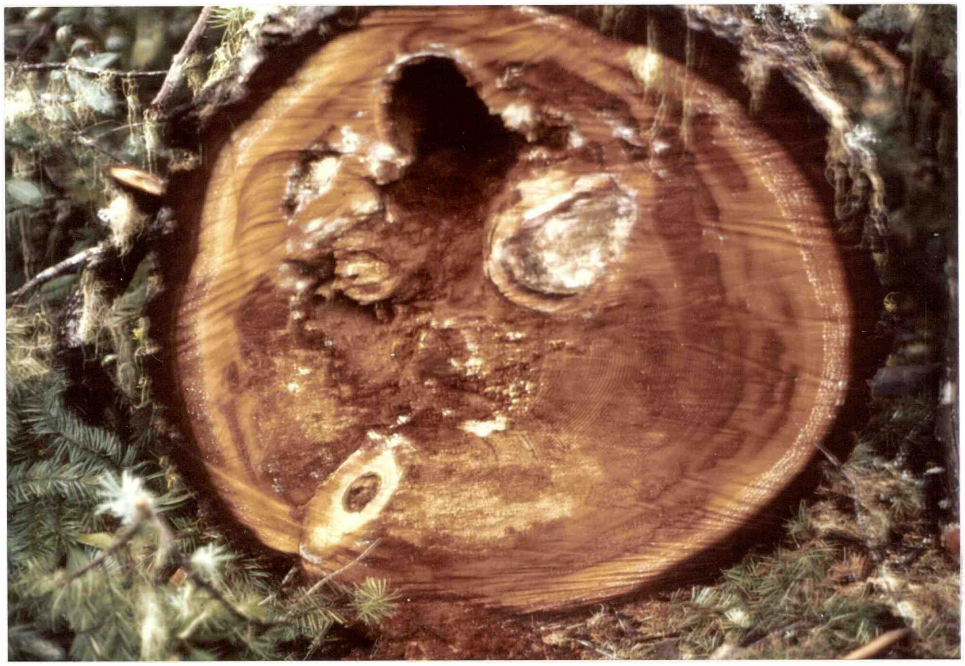

Figure 5--Heartrot caused by *Fomes pini* at approximately 50 feet in the trunk. Conks were present but may have been inconspicuous when viewed from the ground.